Calculation factors for determining solid angle of EDS

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Measurement of the solid angle of EDS is important for quantitative analysis. There are two methods that measure the solid angle of an EDS detector in TEM. One method calculates the solid angle from the X-ray intensity of NiOx by using the equation of Egerton et al [1]. Another method calculates from the theoretical intensity, such as the Zeta factor method [2]. Table 1 shows a comparison of the solid angles calculated using the different methods. These solid angles are calculated from the same EDS spectrum of NiOx. The EDS spectrum was acquired by a JEM-ARM300F equipped with a 158 mm^2 area SDD. The calculated solid angles vary very much. The Egerton's method tends to underestimate the solid angle. The theoretical calculation has a problem in the ionization cross-section. There are many ionization cross-section tables and the values of these tables vary widely. The calculated solid angle is dependent on the ionization cross-section.

In the presented work, we introduce a new factor for calculating the solid angle from X-ray intensity in order to measure the correct solid angle of an EDS more accurately.

Table 1. Comparison of the solid angle calculated from the EDS spectrum of NiOx.

Method	Designed	Egerton [1]	Theoretical	Theoretical
Ionization cross-section	-	-	Paterson[3]	Zaluzec[4]
Solid angle [sr]	1.11	0.70	1.01	0.73

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[3] J.H. Paterson et al., J. Microsc. 154 (1989)
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